

Plan Components

Vegetation

Vegetation reflects native forest diversity as described below for forest vegetation composition, size classes, densities, and patterns that would be present if landscape system drivers (fire, insects and pathogens are the primary agents) were fully functioning. The forest is resilient in the face of changing climate conditions. Species, densities, size classes, and vegetation patterns are represented in their biophysical settings described below, at the levels that promote system health and resilience.

Forest Wide Desired Conditions

Species across the forest are represented by dominance types. Densities are described by trees per acre and basal area per acre. Size classes are measured by a range of diameter classes – early seral non-forest, trees 0” to 5”, 5” to 15”, 15” to 20”, and 20” and greater. Some acres of the larger size classes will qualify as old growth as defined in “North Idaho Old Growth” by Green et al. 1992 errata corrected 2011.

On lands not suitable for timber production (3.4 million acres) old growth as defined in Green et al. 1992 errata corrected 2011, is found at levels consistent with and sustained by natural processes.

On lands suitable for timber production, (approximately 600,000 acres) old growth is found primarily in the interfingered lands that are not suitable, such as, but not limited to, riparian areas and landslide-prone lands. Consistent with the disturbance regimes on those lands, additional areas of old growth occur, and may persist for decades. Old growth on these lands is more transient than on lands not suitable for timber production, and will come and go across the landscape.

Desired Conditions by Biophysical Setting:

Breaklands:

Idaho Batholith:

On southerly aspects, stands of ponderosa pine and Douglas-fir are most common with lesser amounts of grand fir. Grand fir or subalpine fir may occur on lower slopes and along streams. Western redcedar may occur on more moist sites in the Middle Fork Clearwater or Selway River drainages. Grasses, forbs, or shrubs form the understory.

On northerly aspects, stands of Douglas-fir, western larch, and grand fir types are most common, with inclusions of ponderosa pine on ridgetops. Colder sites may include lodgepole pine. Western redcedar may occur on mesic sites as on the southerly aspects. Understory vegetation is often composed of tall mesic shrubs, or may be very sparse under dense forest canopies.

After disturbance, these sites may be grass or shrub dominance types for decades. Desired dominance types are summarized in Table xxx

Table xxx Desired Dominance Types: Breaklands

Dominance Type	Desired Range
Ponderosa Pine/Mix	21% to 41%
Douglas-Fir	19% to 37%
Lodgepole Pine	3% to 7%
Western Larch/Douglas-Fir	3% to 7%
Grand Fir/Western Redcedar	11% to 21%
Subalpine Fir/Spruce Mix	2% to 4%
Seral Grass/Shrub	8% to 16%
Non-Forest	16%

On southerly aspects the forest is one- or two-storied. Younger trees occur as even-aged groups interspersed among the long-lived, shade-intolerant species. Disturbances promote an open canopy of large old trees. Open canopies encourage a rich understory of grasses, forbs, and shrubs. Large trees, over 20 inches in diameter, are common on these southerly slopes.

Northerly aspects tend to have complex stand structures with even-aged patches interspersed among two- to multi-storied forests. Forests are made up of Douglas-fir and grand fir, and western larch is found here too. Ponderosa pine is less common than on southerly aspects. This reflects the mixed severity fire regime that was most common on these sites. Large old trees tend to be found on upper slopes, ridgelines or in riparian areas. Those on the ridgelines are generally ponderosa pine or western larch, while the riparian forests are more often grand fir, spruce or western redcedar. Old growth forests may be found on ridges, upper slopes, and in riparian areas. Moist sites in the Selway/Middle Fork Clearwater drainages may also have old growth forests on cedar sites on lower slopes along streams. The desired size class distribution is summarized in Table yyy

Table yyy Desired Size Distribution: Breaklands

Size Class	Desired Range_s
Non-Forest	16%
Seral Grass/ Shrub	6% to 15%
0" to 5"	3% to 7%
5" to 15"	25% to 49%
15" to 20"	10% to 20%
20" plus	11% to 23%

A portion of this large tree size class meets the description of old growth as described in “North Idaho Old Growth”, (Green et al. 1992, errata corrected 2011). On southerly aspects, these forests of large trees (20 inches and greater in diameter) are typically ponderosa pine with some Douglas-fir and grand fir, often found on midslopes and ridges. On northerly aspects, the old growth is often found in riparian areas, or as two-storied stands with legacy trees outside of riparian areas.

On south aspects these stands are open (typically 25 to 100 mature trees per acre), with basal areas at maturity of 80 to 150 square feet per acre. On northerly aspects, stand densities are generally higher: 75 to 125 mature trees per acre, with basal areas of 100 to 200 square feet per acre.

On southerly aspects large (over 20" diameter) soft snags are uncommon. Northerly aspects have a more dynamic snag system, with longer intervals between high levels of snags. The complex stand structures lead to a wide size range of snags. Larger sizes of snags and down wood are preferred, if available, for longer persistence in the soil and enhanced wildlife habitat. Recommended numbers of snags are 1 to 3 per acre over 20 inches in diameter, and 7 to 15 in the 10" to 20" size classes. Arrangement may vary from individual trees to groups. On southerly aspects, new snags are created every 10 to 25 years. On northerly aspects, snag numbers vary widely over time with the stand replacing disturbance regime. Riparian habitats support the greatest density of large snags. Dead wood on the forest floor is described in the soils section.

On southerly aspects, low severity disturbances occur every 5 to 50 years, reducing trees per acre and retaining the larger trees. Steep slopes and narrow riparian habitats result in a disturbance interval in riparian and moist habitat inclusions that rarely exceeds 150 years. On northerly aspects, a mix of lethal and mixed-severity disturbances occurs every 40 to 160 years, with stand-replacing disturbances occurring every 120 to 160 years. Following stand replacement on northerly aspects, the forest is generally made up of large patches of even-aged stands, that gradually develop a mixed composition and age class as mixed-severity disturbances affect portions of the larger patch. Stand-replacing disturbance boundaries generally follow topographic breaks such as draws, ridges and changes in aspect.

Insects and disease, western pine beetles including mountain pine beetle, Douglas-fir beetle, *Scolytus* beetle and *Armillaria*, *Annosus*, and *Phellinus* root rots are at light to moderate endemic levels in the landscape, causing sporadic mortality in overstory trees. If anticipated climate change develops as projected, these system drivers are expected to increase in extent and effect.

Bitterroot Mountains:

On southerly aspects, stands of Douglas-fir, grand fir, western larch, western white pine, and ponderosa pine dominance types are the most prevalent. Grand fir and western redcedar are often found on lower slopes along stream channels.

On north aspects, Douglas-fir, grand fir, western larch, and western white pine are the most common dominance types. They tend to occur in even-aged stands, often with large-diameter legacy trees, in patches that follow topographic breaks. Following stand replacement on northerly aspects, the forest is generally made up of large patches of even-aged stands, which gradually develop a mixed composition and age class as mixed-severity disturbances affect portions of the larger patch. Stand-replacing disturbance boundaries generally follow topographic breaks such as draws, ridges and changes in aspect.

Cedar and western white pine tend to be limited to deeper soils (any aspect) and moist draws (southerly aspects). Seral hardwood trees, such as birch and tall shrubs, are also

a distinctive type that establishes after fires and may be maintained by lack of tree seed source or root rots. Grand fir and western redcedar are the shade-tolerant species that may establish immediately after disturbance but will always fill in under the forest canopy over time. Mature western redcedar or western hemlock, though not common, may be found on lower slopes and in riparian habitats. The desired range of species composition is found in Table zzz.

Table zzz Desired Dominance Types: Bitterroot Mountains Breaklands

Dominance Type	Desired Range
Ponderosa Pine/Mix	9% to 19%
Douglas-Fir	14% to 22%
Lodgepole Pine	0% to 0%
Western Larch/Douglas-Fir	13% to 20%
Cedar/Grand Fir	9% to 17%
White Pine	10% to 25%
Spruce/Fir Mix	0% to 0%
Seral Grass/Shrub	8% to 15%
Non-Forest	10%

On southerly aspects, young forests are commonly found as small (less than 10 acres), even-aged patches within a large forest patch that covers an entire hillside. The overall stand structure is often a large patch size of two-storied or uneven-aged forest, with the smaller patches of young forest embedded within.

On northerly aspects, forests tend to be even-aged after stand-replacing disturbances. Forests that start out even-aged usually develop several age classes due to small, low to mixed severity disturbances. Isolated large, live trees (greater than 20 inches in diameter, and often greater than 30 inches) are expected to occur on ridges (western larch or ponderosa pine) and in riparian conservation areas (usually grand fir or western redcedar) at an average density of 2 to 5 per acre (ranging from 0 to covering 20% of the acreage), and persist indefinitely.

The large (20 inches and over) size class makes up 17 to 33 percent of the landscape. These are most often found on ridgelines or in riparian areas. Mature forests on the breaklands are composed of ponderosa pine, western larch and grand fir dominance types on the ridges and side slopes. On lower slopes and riparian areas, these are often grand fir or western redcedar dominance types. Desired size class distribution is found in Table aaaa

Table aaaa Desired Size Distribution: Bitterroot Mountains Breaklands

Size Class	Desired Range
Non-Forest	10%
Seral Grass/Shrub	8% to 17%
0" to 5"	6% to 13%

5" to 15"	17% to 36%
15" to 20"	16% to 33%
20" and greater	17% to 33%

A portion of this large tree size class meets the description of old growth as described in “North Idaho Old Growth”, (Green et al. 1992, errata corrected 2011). Old growth on southerly aspects can be old ponderosa pine on hillsides, or could be mixed conifer or grand fir and cedar in riparian areas. On northerly aspects, the old growth is often found in riparian areas, or as two-storied stands with legacy trees outside of riparian areas.

On northerly aspects, young stands may be dense, with over 1000 stems per acre, or may be widely spaced (100 to 200 trees per acre) under a hardwood canopy. Dense stands rapidly decrease in density as the canopy closes and trees compete for available moisture. Southerly aspects, especially those with shallow soils, are slower to regenerate to forest cover, have fewer trees per acre and may support a tall shrub layer for several decades. Typical densities within the large size class are 45 to 100 large trees per acre.

Snag numbers on southerly aspects range from .2 to 1 per acre over 20 inches diameter, and 1.5 to 8 per acre that are 10 to 20 inches in diameter. Northerly aspects have 2 to 5 snags per acre over 20 inches in diameter, and 10 to 20 in the 10 inch to 20 inch diameter classes. New snags are recruited frequently through insects, disease or low-severity fires. A few large, standing (“legacy” or “relict”) live trees per acre – one to three per acre, ranging from 0 to 20% of the acreage – typically persist following stand-replacing events. Riparian conservation areas support the greatest density of large snags and down wood. The desired levels of down wood are shown in the soils section. Larger diameters are desired, if available, for persistent and more effective wildlife habitat.

Disturbances tend to reduce Douglas-fir, grand fir and cedar, result in more open stand conditions (fewer trees per acre than before the disturbance), and favor retaining larger trees. Intermediate or mixed severity disturbances are 3 to 5 times more common than the stand replacing disturbances. Typically, mixed-severity disturbances occur every 40 to 180 years, and stand-replacing fires occur every 100 to 300+ years. Mixed severity disturbances reduce the number of trees per acre, favor shade-intolerant species, reduce canopy layers, and create openings in the stand.

Insects and disease are at low to moderate endemic levels in the landscape. If anticipated climate change develops as projected, these system drivers are expected to increase in extent and effect.

Patches sizes on north aspects are generally even-aged forests with legacy trees that range up to XXX (to be determined through SIMPPLLE modeling) acres and generally have their borders on topographic breaks such as ridges, draws or changes in aspect. Patches on southerly aspects tend to be uneven-aged and smaller, up to XXX (to be determined through SIMPPLLE modeling) acres.

Uplands:

Idaho Batholith

Douglas-fir, western larch, ponderosa pine, and lodgepole pine often form the majority of the seedlings that establish after disturbance. Colder, drier sites are likely to have nearly pure lodgepole pine stands or Engelmann spruce and subalpine fir; warmer or moister sites are usually a mix of species including western larch, Douglas-fir, and ponderosa pine. Shrubs are prolific and diverse on these sites, and may dominate the site for 30 or more years after disturbance. Ponderosa pine is less common than on breaklands, but is long-lived, and often an influential part of the stand. Grand fir is often the most common species. Grand fir and Engelmann spruce predominate on grand fir mosaic sites. Riparian habitats are often characterized by mature grand fir, western redcedar, or spruce. Desired dominance types are summarized in bbbb.

Table bbbb. Desired Dominance Types: Uplands

Dominance Type	Desired Range
Ponderosa Pine/Mixed	11% to 23%
Douglas-fir	11% to 23%
Lodgepole Pine	15% to 29%
Western Larch/Douglas-fir	3% to 7%
Grand Fir/Western Redcedar	21% to 41%
Subalpine fir/Spruce Mix	2% to 4%
Seral Grass/Shrub	3% to 7%
Non-Forest	4%

The forest is commonly even-aged or two-aged and often has grand fir mixed with the shade-intolerant species. As forests grow after stand-replacing disturbance, they begin to develop additional age classes due to low- or mixed-severity disturbances. For the largest size class, the typical forest character is 5 to 25 large, old ponderosa pine, Douglas-fir, or western larch trees per acre with a mix of small to large-sized grand fir. The large size class is most widespread and persistent in riparian areas and adjacent uplands. Overall, desired size class distributions are summarized in Table cccc.

Table cccc Desired Size Distribution: Uplands

Size Class	Desired Range
Non-Forest	4%
Seral Grass/Shrub	3% to 7%
0" to 5"	6% to 13%
5" to 15"	21% to 41%
15" to 20"	18% to 36%
20" and greater	18% to 36%

A portion of this large tree size class meets the description of old growth as described in "North Idaho Old Growth", (Green et al. 1992, errata corrected 2011). The typical old growth forest character is dominated by large, old grand fir. Because the uneven terrain encourages low- and mixed-severity wildfires, old forest patches historically have been uneven-aged, shade-tolerant species residing in patches exceeding 300 acres. Smaller

patches of old forest occur as “inclusions” where topography or microsites are sheltered from frequent fires.

These stands are generally well-stocked except in the grand fir mosaic. Density varies as small openings develop in the stands over time. Typical basal areas at maturity are 150 to 200 square feet per acre. In the grand fir mosaic, densities in older stands are typically 100 to 200 square feet of basal area per acre.

Recommended numbers of snags are 2 to 4 per acre over 20 inches in diameter, and an additional 10 to 24 per acre that are 10 to 20 inches in diameter. These may be grouped in clumps, or found as individuals. Riparian habitats support the greatest density of large snags and down wood. Large, dead wood desired conditions are found in the soils section. Larger material, if available, is preferred for long-term soil maintenance and greater value as wildlife habitat.

Mixed-severity disturbance occurs every 30 to 50 years, reducing stand density, removing smaller trees, and making openings in the canopy. At 120 to 200 years, stand replacement occurs, typically leaving about 20% of the overall canopy, mostly in riparian areas and isolated upland patches.

Root diseases, Douglas-fir beetle, western spruce budworm and mountain pine beetle are the most common insects and pathogens. Most of the time they act to move the forest toward climax stand conditions and maintain more open stands. Insects and disease should be at moderate endemic levels in the landscape. If anticipated climate change develops as projected, these system drivers are expected to increase in extent and effect.

Douglas-fir is only moderately long-lived on these sites due to root rot susceptibility. On more moist sites, it is often gone from the stand by 80 years after stand-replacing disturbance. On the drier end, it may persist for over 150 years.

Lodgepole pine is perpetuated by stand-replacing disturbances about every 100 to 150 years.

Bitterroot Mountains:

Dominance types are primarily western redcedar, grand fir, Douglas-fir, western larch and western white pine. Ponderosa pine and lodgepole pine are less common seral species; ponderosa pine on southerly aspects and ridges, lodgepole on cooler sites. Riparian habitats are often mature western redcedar or grand fir dominance types. Western hemlock also occurs on the Palouse Ranger District and in portions of the North Fork Clearwater drainage. The grand fir mosaic forests are almost pure grand fir or subalpine fir with Engelmann spruce or western white pine. Desired species composition is found in Table dddd.

Table dddd Desired Dominance Types: Bitterroot Mountains Uplands

Dominance Type	Desired Range
Ponderosa Pine/Mixed	5% to 10%
Douglas-fir	5% to 15%
Lodgepole Pine	3% to 7%
Western Larch/Douglas-fir	7% to 15%
Cedar/Grand Fir	15% to 25%
White Pine	20% to 40%
Spruce Mix	1% to 1%

Seral Grass/Shrub	3% to 7%
Non-Forest	3%

Younger forests are commonly even-aged with legacy trees. Large, live trees (typically western white pine or western larch, occasionally ponderosa pine and Douglas-fir on the uplands; western redcedar and grand fir in riparian habitats) persist in groups or as individuals, typically 1 to 3 per acre but varying from 0 trees to 20% of the disturbance area, following stand replacement. These groups occur mostly as riparian stringers, individual trees are scattered across the hillside and on ridgelines. The typical old forest character is of two types. One is large old cedar and/or western hemlock with grand fir and scattered western larch, western white pine or ponderosa pine. The second is made up of large, old western white pine, western larch, and sometimes ponderosa pine. Old forests usually develop several age classes. The large size class, trees over 20 inches in diameter, should be about 18% to 36% of the landscape, and includes stands of old forest. Desired size class distribution is found in Table eeee.

Table eeee Desired Size Distribution: Bitterroot Mountains Uplands

Size Class	Desired Range
Non-Forest	3%
Seral Grass/Shrub	3% to 7%
0" to 5"	6% to 13%
5" to 15"	21% to 41%
15" to 20"	18% to 36%
20" and greater	18% to 36%

A portion of this large tree size class meets the description of old growth as described in “North Idaho Old Growth”, (Green et al. 1992, errata corrected 2011). The typical old forest character is dominated by large, old grand fir or cedar, often associated with riparian areas. Because the uneven terrain encourages low- and mixed-severity wildfires, old forest patches historically have been uneven-aged, shade-tolerant species residing in patches exceeding 300 acres. Smaller patches of old forest occur as “inclusions” where topography and/or local factors locally shelter sites from frequent fires.

These sites are generally well stocked except in the grand fir mosaic. Young stands often have up to 600 to 1,000 trees per acre or may be widely spaced (100 to 200 trees per acre) under a hardwood canopy. Dense stands rapidly decrease in density as the canopy closes and trees compete for available moisture. Typical basal areas at maturity (160+ years) are 150 to 250 square feet per acre. Grand fir mosaic sites have much lower densities, down to about 1/2 of the typical density on non-mosaic sites.

Large, dead wood desired conditions are found in the soils section. Snag numbers range from 2 to 5 per acre over 20 inches diameter, and 11 to 21 per acre that are 10 to 20 inches in diameter. Snags are usually arranged in clumps of various sizes, with a few scattered individual snags. Riparian habitats, due to extremely long fire return intervals, can support the greatest density of large snags and down wood.

Low and mixed severity disturbances occur 2 to 3 times as often as stand replacing disturbances, which occur every 250 or more years apart. The mixed severity disturbances reduce numbers of trees per acre, create openings in the stand and favor shade-intolerant, fire-resistant species.

Douglas-fir is fairly short-lived on these sites due to root rot susceptibility. It is often gone from the stand 80 to 120 years after stand-replacing disturbance. Root disease, Douglas-fir beetle, mountain pine beetle, western spruce budworm and white pine blister rust are the most common insects and pathogens. Most of the time they act to move the forest toward climax stand conditions but they also effectively maintain more open stand conditions. Insects and disease are at low to moderate endemic levels in the landscape. If anticipated climate change develops as projected, these system drivers are expected to increase in extent and effect.

Landscape patches start as large expanses of single-storied or simple two-storied stands following stand-replacing events. As stands age, they develop increasing heterogeneity in species composition and size classes across the original disturbance area. Patch sizes range from 5 to 700 acres. The more frequent disturbances tend to be smaller in size, with stand-replacing disturbances tending toward the larger sizes.

Subalpine:

Idaho Batholith:

On more moderate sites within this setting, Douglas-fir, western larch and lodgepole pine often form the majority of the stocking after disturbance. Engelmann spruce, subalpine fir and grand fir, with inclusions of western redcedar, are the tolerant species that will become established in the understory, or in small openings where larger trees have died. Subalpine fir is the most common understory species. Colder, drier sites are likely to have nearly pure lodgepole pine stands; more moderate sites are usually a mix of species. Whitebark pine is common above 6500 feet, either as pure stands or mixed with other species. Riparian habitats are often dominated by mature spruce and subalpine fir. Shrubs are prolific and diverse on these sites, and may dominate for 30 years after disturbance. Table ffff summarizes the desired dominance types for the subalpine setting.

Table ffff. Desired Dominance Types: Subalpine

Dominance Type	Desired Range
Ponderosa Pine/Mixed	0% to 0%
Douglas-fir	4% to 7%
Lodgepole Pine	12% to 23%
Western Larch/Douglas-fir	3% to 6%
Grand Fir Mix	0% to 0%
Subalpine Fir/Spruce Mix	16% to 31%
Subalpine fir/Whitebark pine	13% to 27%
Seral Grass/Shrub	3% to 6%
Non-Forest	20%

On the more moderate sites young stands are commonly an even-aged mix of species, both shade tolerant and shade intolerant. There are often large old larch, Douglas-fir, subalpine fir and spruce found in small groups or as scattered individuals. Starting about 50 years after stand-replacing disturbance, forests begin to develop additional age classes. The younger trees under a canopy of older trees or in small openings are characteristically subalpine fir, Engelmann spruce or grand fir. The typical old forest character is large old spruce and subalpine fir with larger, older western larch, Douglas-fir or lodgepole pine, and is often multi-storied. It is most persistent in riparian areas but may also be found on slopes and ridges.

On the colder and drier sites, forest structure is quite patchy, with openings and a mix of size classes. This develops due to slow reforestation after disturbance on these harsh sites as well as continuing low-level disturbance.

As stands develop, mixed severity disturbances occur, creating variable-sized gaps. As young stands age, they develop gaps up to a few acres in size. The result is increasing heterogeneity in species composition and size classes over time. Two or more canopy layers are common, and provide snowshoe hare and lynx habitat in spruce-fir types. These diverse stands are the most common structure on the landscape. Streams and wet areas are important factors that often remain forested when surrounding forests have stand-replacing disturbance.

Desired size class distribution is summarized in Table mmmm.

Table mmmm Desired Size Classes: Subalpine

Size Class	Desired Range
Non-Forest	20%
Seral Grass/Shrub	3% to 6%
0" to 5"	10% to 20%
5" to 15"	23% to 47%
15" to 20"	4% to 8%
20" and greater	4% to 8%

A portion of the 15" to 20" and 20" and greater size classed meet the description of old growth as described in "North Idaho Old Growth", (Green et al. 1992, errata corrected 2011). Old growth is of two types, lodgepole pine can be found in the 15" to 20" size class, and comes and goes on the landscape as mountain pine beetle and fire affect it. Mixed conifer old growth is quite variable but may be a mix of larch and Douglas-fir, or multi-storied subalpine fir and Engelmann spruce, as well as other types. Whitebark pine may also persist and form old growth stands, though they are less common now that blister rust has affected this species.

On mesic sites, and at young ages, these stands may have high numbers of trees per acre, or they may be slow to regenerate and have few trees per acre for decades. Density varies as the stand ages and disturbances create small openings in the stand, or remove understory layers. Higher elevation, colder sites, where whitebark pine may be found, have lower stocking levels, down to 1/2 of the levels found on mesic sites, and take longer to reforest following disturbance. Typical basal areas at maturity are 130 to 200 square feet per acre. Wetter sites, including much of the grand fir mosaic, often have the lower basal areas, with a rich, diverse shrub and forb layer.

The amount of standing dead wood varies widely over time. Snag presence is very dynamic. Large expanses of snags are created about every 100 years. Those snags are the larger sizes, and as they fall, snags numbers decline sharply. Between these periods of extensive snag distribution, snags would be present at lower numbers, about 1 to 3 per acre over 20 inches in diameter, and an additional 17 to 28 per acre that are 10 to 20 inches in diameter. The higher numbers would generally be found after fire events. In lodgepole pine stands, snags over 20 inches in diameter are uncommon, less than 1 per acre, while snags 10 to 20 inches in diameter are much more common, 4 to 13 per acre. Large dead wood desired conditions are found in the soils section.

Low- and mixed-severity disturbances occur frequently (every 30 to 50 years), reduce stocking levels and create openings that range from less than an acre to 5 acres in size. Less frequently (120 to 175 years) stand-replacing disturbances initiate a new even-aged forest. Remnants of the previous stand cover up to 20% of the area, usually in riparian areas and isolated patches. Drier sites tend to have mostly stand-replacing disturbances, while more moist sites have more mixed disturbances.

Root disease, Douglas-fir beetle, spruce budworm and mountain pine beetle are the most common insects and pathogens. Most of the time they act to move the forest toward uneven-aged, climax stand conditions, but also maintain more open stand conditions. Lodgepole pine across the landscape represents a variety of size and age classes so that not all of it is susceptible to mountain pine beetle at the same time.

Bitterroot Mountains

On more moderate sites within this setting, Douglas-fir, western larch, western white pine and lodgepole pine are important intolerant species that are the primary dominance types after stand replacement. Engelmann spruce, subalpine fir, and mountain hemlock are the tolerant/climax species. These species may codominate with the intolerant species following disturbance, or may gradually establish under the canopy of seral species. Which species dominate depends on the time since stand replacement, microclimatic conditions and seed availability. Riparian habitats are dominated by mature Engelmann spruce, mountain hemlock, subalpine fir, grand fir and western redcedar. Elevations above 6500 feet may support whitebark pine and alpine larch. Desired species composition is found in Table gggg

Table gggg Desired Dominance Types: Bitterroot Mountains Subalpine

Dominance Type	Desired Range
Ponderosa Pine/Mixed	0% to 0%
Douglas-fir	0% to 0%
Lodgepole Pine	20% to 29%
Western Larch/Douglas-fir	4% to 8%
Cedar/Grand Fir	0% to 0%
White Pine	0% to 2%
Subalpine fir/Mountain Hemlock/Engelmann spruce/Whitebark pine	10% to 20%
Subalpine fir/Whitebark pine	15% to 31%

Seral Grass/Shrub	9% to 20%
Non-Forest	14%

Young forests are commonly even-aged with relicts surviving from previous disturbances. Those relicts may cover up to 20% of the area and may occur as individual trees or in clumps. Riparian zones have less frequent stand-replacing disturbance and are dominated by climax species. Starting about 50 years after stand-replacing disturbance, forests begin to develop additional age classes and are multi-storied. The younger trees under a canopy of older trees or in small openings are characteristically subalpine fir, Engelmann spruce or grand fir. The typical old forest character is large, old western larch and Douglas-fir with scattered lodgepole pine; whitebark pine; or mature subalpine fir, Engelmann spruce or mountain hemlock. Old forests usually develop several age classes. Desired size class distribution is found in Table hhhh.

Table hhhh Desired Size Classes: Bitterroot Mountains Subalpine

Size Class	Desired Range
Non-Forest	14%
Seral/Grass Shrub	11% to 23%
0" to 5"	3% to 5%
5" to 15"	39% to 79%
15" to 20"	7% to 14%
20" and greater	7% to 14%

A portion of this large tree size class meets the description of old growth as described in "North Idaho Old Growth", (Green et al. 1992, errata corrected 2011). Old growth is of two types, lodgepole pine can be found in the 15" to 20" size class, and comes and goes on the landscape as mountain pine beetle and fire affect it. Mixed conifer old growth is quite variable but may be a mix of larch and Douglas-fir, or multi-storied subalpine fir and Engelmann spruce, as well as other types. Whitebark pine may also persist and form old growth stands, though they are less common now that blister rust has affected this species.

The more moist sites are generally well-stocked, though density varies over time. Higher elevation, colder sites have lower densities, typically down to 1/2 of the density expected on the mesic sites. Young stands often have 600 to 1000 trees per acre or more, especially in lodgepole types. Typical basal areas at 120+ years are 100 to 200 square feet per acre.

The amount of standing dead wood varies widely over time. There are large expanses of snags created at about 100-year intervals. These snags fall over in a relatively short time. The dead standing trees in the stands, 30 to 75 years after disturbance, are relatively small diameter. Snag numbers are 1 to 3 per acre over 20 inches diameter except in lodgepole pine stands, there the number is less than one per acre. In addition, there are 16 to 28 per acre that are 10 to 20 inches in diameter, or in lodgepole pine stands, 4 to 12 dead trees per acre in this size range. Riparian habitats support higher densities of large snags and down wood. Desired levels of dead wood are found in the soils section.

Root disease, Douglas-fir beetle, fir engraver beetle, spruce beetle, mountain pine beetle and white pine blister rust are the most common insects and pathogens. Typically insects and

pathogens act to move the forest toward climax stand conditions but also maintain more open stand conditions. Lodgepole pine between 80 and 110 years old is readily susceptible to mountain pine beetle outbreaks, and provides a fluctuating supply of snags for wildlife use.

Disturbances tend to be stand-replacing. Patch sizes for the seral shrub and seedling/sapling sizes are generally <100 acres, but approximately 30% may exceed 1,000 acres. As young stands age, they develop gaps up to a few acres in size. Stand structure becomes more complex over time. Two or more canopy layers are common, and provide snowshoe hare and lynx habitat in spruce-fir types.